

SOME SPECIES OF THORACAPHIS AND OF NEARLY RELATED GENERA FROM JAVA (HOMOPTERA, APHIDIDAE)

BY

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Thoracaphis rappardi spec. nov.

Apterous viviparous female. (Fig. 1).

Morphological characters. Body about 0.75—0.90 mm long, shaped like a disc of which the upper surface is caudad somewhat pointed. Tergum dark brown-red, easily cracking under pressure, covered with pale not elevated reticulations in the integumentum, but rather smooth, with almost gland-like intersegmental "Muskelplatten", and median transverse folds between the thoracic and 1st abd. segments; abd. tergites II—VII completely fused to a complex abdominal sclerite, which is encircled by the prosoma (= head + thorax + abd. I), from which it is laterally separated by a membranous fold; the complex abd. sclerite, as well as the quite free VIIIth abd. tergite caudad, with a flat crenulated horizontal crest above which the marginal hairs are placed. Marginal hairs long and fine, with normal, very acute apices, about 0.057—0.105 mm long, caudad longest; dorsal hairs very much shorter and thinner, only about 0.024—0.038 mm long. Chaetotaxy as follows: prosoma with 26 marginal hairs in total, head in front of the eyes with 3 pairs of long hairs, between the eyes with a row of 4 hairs; spinal hairs of the other segments in groups, not in transverse rows or pairs; pronotum with an anterior spinal group of 1—2 hairs, a posterior one of 4—8 hairs and 2 pairs of marginal hairs; mesonotum with one group of 5—10 spinal hairs and 3 pairs of marginal hairs; metanotum with 4—6 spinal hairs and 3 pairs of marginal hairs; 1st abd. tergite only with 2 pairs of marginal hairs. Complex abd. tergite (II—VII) with 6 pairs of shorter marginal hairs and one short hair in front of each siphunculus. VIIIth abd. tergite semicircular, with 4 long hairs along posterior margin. Laterally, below the marginal ridge, groups of many hairs that are shorter than the marginal ones. Antennae distinctly of 3 segments, very short, bent; 1st segment fused basally with the integumentum of the head, with one rather long hair; IInd segment also with one hair; IIIrd segment about twice as long as wide, about $1\frac{1}{2}$ times as long as IInd, 0.047 mm long, with 2 long terminal hairs and with two deep-set quite normal primary rhinaria, one at about $\frac{3}{5}$ of the segment, the other at $\frac{4}{5}$, well before the apex of the segment. Mouth-parts retracted into the head with only the apex of the rostrum through a slit or hole in the ventral carapax emerging;

last rostral segment longer than the tarsi, with 3 subapical pairs of hairs. Eyes dark, slightly elevated, with 3 facets in an equilateral triangle very near each other. Siphunculi somewhat conical, with narrow porus (diameter 0.012 mm), past the middle of the complex abdominal sclerites. Cauda knobbed. Subanal plate bilobed. Subgenital plate slightly incised with about 14 hairs along posterior margin and 2 hairs more cephalad. Legs normal, with 2-jointed tarsi with claws in young specimens, but in old specimens the joints sclerotised and the claws broken or from some legs lost; fore tibiae as long as fore femora, but middle and hind tibiae longer than the corresponding femora.

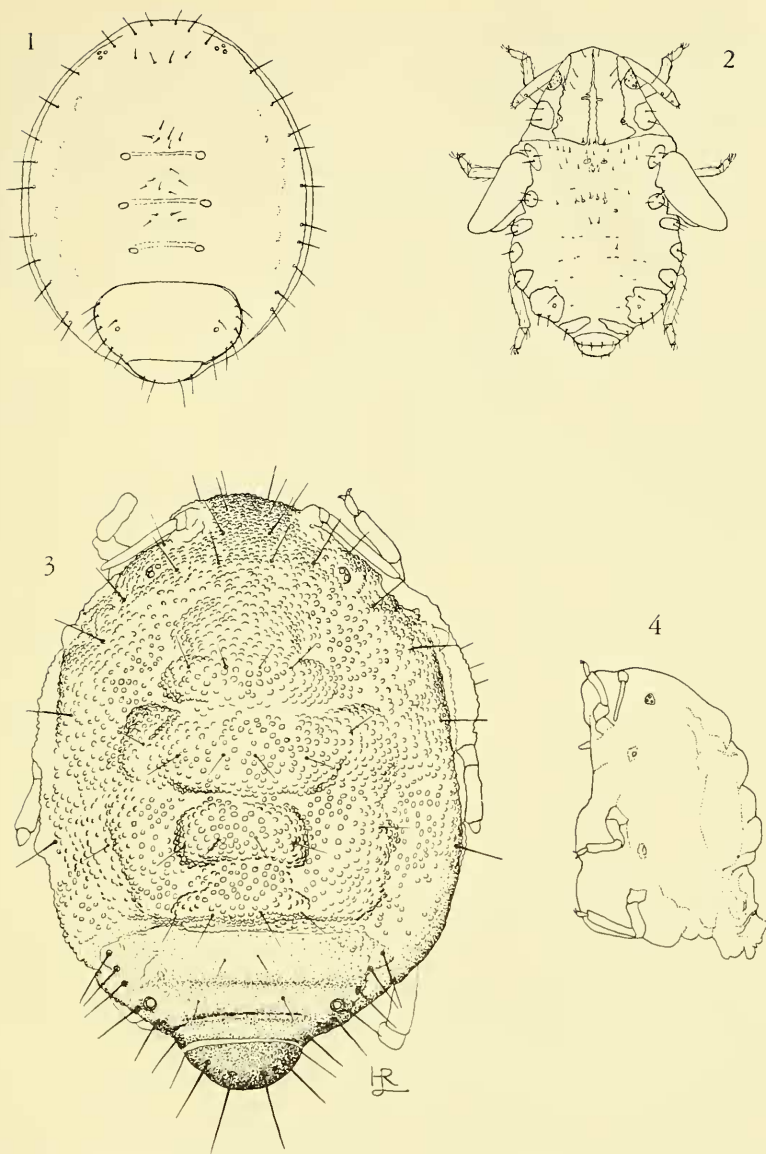
Larvae.

First larval instar. A) Flat and elongated oval. A narrow spinal membranous line from vertex to about IIInd abd. tergite. Head fused with pronotum; mesonotum, metathorax free, all rather dark sclerotic. Abdominal tergites I—VII completely fused, darkish sclerotic, taking about $\frac{2}{5}$ of the length of the body; VIIIth abd. tergite free, broad, dark sclerotic. Hairs rather thick and thorny, the marginal ones curved upwards, about 0.038 to (caudad) 0.067 mm long. Head with some frontal hairs and a row of 4 between the eyes. Pronotum with 2 posterior spinal hairs and two pairs of marginal hairs. Meso- and metanotum with 2 spinal hairs and 2 pairs of marginal hairs. Abd. segments I—VII only with 7 pairs of marginal hairs; VIIIth tergite with 2 very long marginal hairs caudad. Antennae of 4 segments, rather long, imbricated; IIIrd segment nearly 3 times IIInd; IVth twice IIInd, with possibly always 4 long terminal hairs, of which at least one as long as the segment. Siphunculi not developed, indicated by two minute paler spots. Tarsi 2-jointed with normal claws.

B) Very much like preceding, but the VIIIth abd. tergite with straight, not semicircular posterior margin. The last two pairs of marginal hairs on abd. tergites I—VII are often directed caudad and just cephalad of the penultimate pair, a pair of very short, very small marginal hairs occurs, so that 6 pairs of long marginal hairs and one pair of very short hairs occur on the complex abd. tergite I—VII.

Second larval instar. Much stronger pigmented than the preceding, and with different sclerotisation. Pronotum split into two spinopleural parts and two marginal parts. Mesonotum dissolved into two marginal sclerites and a few small spinal sclerites bearing hairs. Metanotum with two marginal sclerites with each 3 hairs and a few very small spinal and spinopleural sclerites two of which each bear a minute hair. Complex of abd. sclerites I—VII medially cleft and Ist abd. tergite dissolved into two free marginal sclerites which usually are fused with the complex sclerite. Antennae of 3 segments, the IIIrd segment 4—5 times as long as IIInd, about 0.109 mm long, tapering towards apex with a neck-like constriction before the apex, with only one more or less distinct primary rhinarium and with rather short terminal bristles. Marginal hairs spiny, increased to 3 pairs on meso- and metanotum, 2 pairs on Ist abd. tergite. Siphunculi small but very distinct, each with one minute hair cephalad. Complex of abd. tergites II—VII with 5 pairs of long marginal spines and 2 minute marginal hairs near the siphunculi (vide Ist instar larva B). VIIIth abd. tergite with 4 hairs along posterior margin.

Third (apterous) larval instar. Broader and larger, but otherwise very much like the preceding; marginal sclerites of pro-, meso- and metanotum nearly or



Figs. 1—2. *Thoracaphis rappardi* spec. nov. 1. Apterous viviparous female. Antennae and legs not shown. 2. *Thoracaphis rappardi* spec. nov. Last instar nymph of alate. Fig. 3. *Nipponaphis ficicola* spec. nov. Apterous viviparous female. Hairs and legs not shown. $\times 65$. Fig. 4. *Nipponaphis ficicola* spec. nov. Sketch of apterous viviparous female in lateral view

completely split into 2 pairs of sclerites per segment; more spinal hairs present on thoracal segments; 1st abd. sclerite split into free marginal sclerites and small free hairless spinal sclerites. Antennae thin, rather like those of apterae; IIIrd segment only 3 times IIrd, about 0.076 mm long. Abd. tergites II—VII with 5 pairs of

long marginal hairs and one pair of little shorter marginal hairs before the penultimate long pair.

Third (alate) larval instar. No wing pads, but antennae very thick, almost swollen, tapering, of 4 segments with distinct rhinaria. Eyes of 3 ommatidia, on free sclerites. Pro, meso and metanotum each with one pair of marginal sclerites bearing 2 or 3 hairs. Marginal sclerites of abd. segments I with each 2 hairs, those of segments III and VII with one hair each; abd. tergites IV to VI merged, with large marginal sclerites bearing a siphunculus, with cephalad a short hair, and with 3 marginal hairs. Very small spinopleural intersegmental sclerites between all the segments, but otherwise without sclerotisation. Spinally only cephalad IIInd abd. tergite any hairs present. The marginal hairs mostly distinctly pigmented for $2/3$ of their length, but from thereon pale.

Fourth (alate) larval instar (Fig. 2). With wingpads, otherwise very much like the preceding, but antennae of 5 segments, eyes with triommatidion and large perforated plate cephalad indicating the compound eye. Hairs cephalad the siphunculi rather long. Marginal sclerites on VIIth tergite far extended towards the median line. Some scattered small spinal sclerites present on meso and metanotum, but caudally no spino-pleural sclerotisation present as far as VIIth abd. tergite.

Host plant: *Viscum articulatum* L.

Locality: Soekowono Ketjil (700 m), Bondowoso, Eastern Java, 9.XII.1948, leg. F. W. RAPPARD.

Notes by Mr. RAPPARD: "Only on young specimens of the plant, not on full-grown specimens. The host is a hyperparasite, growing on *Scurrula* a parasite on Kapok (*Ceiba*). Colonies very small, not larger than 5 mm, on the stems. Adult apterae dark. Larvae yellowish green with dark green spots. Visited by ants".

The species is easily recognized by the curious chaetotaxy, particularly by the presence of a hair in front of each siphunculus and by the structure of the rhinaria in the aleurodifform apterae.

Types: Cotypes in the collection of both authors.

Schizoneuraphis gallarum van der Goot 1917

1917. GOOT, P. van der, Contrib. Faune Ind. Néerland., vol. 1, fasc. III, p. 252—258.

From the description of the galls by VAN DER GOOT it is evident that he had two very similar ones, one hard and one soft gall. His "fundatrices" are evidently described from the soft galls, the alate fundatrigeniae from the hard galls. The latter we indicate as the type morph of this species. Therefore a new description of the true fundatrix and of the apterous 2nd generation inside the galls is necessary.

I. Material from *Distylium stellare*.

Fundatrix.

Body about 0.80—1.10 mm long, globular, not pigmented, with long and fine hairs of about 0.075 mm long. Antennae about $1/7$ — $1/6$ length of body, rather dark, of distinctly 3 segments; IIIrd segment 3 times as long as IIInd, from the middle gradually tapering, with a rhinarium at $3/5$ from base and another one

halfway at $1/5$ from the tip. Last rostral segment about 0.065 mm long. Siphunculi present as pores, but not pigmented and easily overlooked. Cauda hardly developed, pigmented part 3 times as wide as long, triangular with rounded apex. Subanal plate very little incised, sometimes seemingly with straight posterior margin in dorsal view. Legs darkish, very short; fore and middle femora, e.g., 0.10 mm long by 0.043 mm wide, fore tibiae 0.13 mm long by 0.026 mm wide, hind femora about 0.19 mm long by 0.06 mm wide, hind tibiae 0.18 mm long by 0.030 mm wide, so that the hind femora are not much thicker, comparatively; tarsi 2-jointed.

Apterous viviparous female (2nd generation inside gall).

Rather like the preceding morph, but more elongated, with similar hairs which are slightly shorter (marginally up to 0.060 mm). Antennae about $2/9$ length of body, dark, of 4, rarely 5 segments; in specimens with 4 segments IIIrd segment about 0.110—0.115 mm long, 3 times as long as IInd segment, with a nearly terminal rhinarium; in specimens with 5 segments IIIrd segment about 0.070—0.075 mm, not very clearly separated from IVth segment which is about $5/7$ of that length and of the same thickness; last segment thinner than the preceding, about 0.070—0.075 mm long, with a distinct, thinner processus terminalis of nearly $1/4$ the length of the segment. Last rostral segment along its ventral surface about 0.09 mm long. Siphunculi distinct because they are pigmented. Cauda more produced. Subanal plate distinctly incised. Legs longer; fore femora 0.185×0.06 mm, fore tibiae 0.185×0.03 mm; hind femora 0.270×0.067 mm, hind tibiae 0.0280×0.037 mm.

II. Material from *Litsea*.

Apterous viviparous female (Exul). (Fig. 5).

Body in dorsal view about circular, about 0.80—1.00 mm long, evidently not depressed. Tergum brown sclerotic, smooth, with some transverse striae and oval varioli pleurally between the thoracal segments, and with a curious flat, horizontal, crenulated crest on both sides of the abdominal tergites and along posterior margin of VIIIth abd. tergite; a slight fold present between pro- and mesonotum, but no clear division between prosoma and abdominal tergites II—VII. Dorsal hairs extremely stout, hollow, long and nearly acute, about 0.161—0.176 mm long (Fig. 5a) and about 0.010 mm thick; chaetotaxy as follows: between the antennal bases four very small, thin hairs, slightly higher another much larger pair, then between the eyes a caudad curved transverse row of 6 large hairs; pronotum with 2 spinal and 4 marginal hairs; mesonotum with 2 spinal hairs and in a transverse row 6 marginal hairs; metanotum with 2 spinal hairs and 6 similar marginal hairs; Ist abd. tergite with 2 spinal hairs and 4 marginal hairs; complex of abd. segments II—VII with one spinal pair of large hairs near posterior margin and along both sides first 2 large hairs, 1 extremely small hair, then one rather small hair and again a large hair but smaller than the spinal ones; these marginal hairs are placed above the marginal ridge; the semilunar VIIIth abd. tergite with on posterior margin 2 spinal, large hairs and more laterally 2 normal, thin hairs. The sides of the body show normal, long, thin hairs. Antennae about $2/15$ — $1/6$ length of

body, pale brownish, of 3 segments, but the 1st segment completely fixed to the head; 11nd segment longer than wide; 111rd segment rather slender, at least 6 times as long as its largest width, with at $\frac{2}{3}$ of its length a small, finger-shaped rhinarium and another one at the apex. Siphunculi mere pores of about 0.014 mm on posterior half of the complex abdominal tergite. Cauda with about 8 hairs. Subgenital plate with about 12 hairs along posterior margin, and a pair on its disc. Legs rather long, in life straight and sticking far out from under the body, with normal tarsi and claws; first tarsal joints with 3, 3, 2 hairs. Thoracic stigmata surrounded by drawn-out reticulations.

Measurements of one specimen: Length of body: 0.81 mm; ant.: 0.13 mm; Prop. of ant. segments: $\frac{20}{II} : \frac{100}{III}$.

Larvae.

First instar larvae. Elongated. Dorsally with long, very thick hairs with acuminate apex of about 0.095 mm long. Arrangement of these hairs: head: 2 on front, 4 in line between the eyes; pronotum: 2 pairs marginally, 1 pair spinally on posterior half; mesonotum and metanotum: 4 marginally, 2 spinally, all in transverse rows; abd. tergite I: 2 spinally, 2 marginally; abd. tergites II and III; 2 marginally; abd. tergite VII, which is narrow and elevated: 2 marginally; abd. tergite VIII: 2 "spinally". Smaller hairs present on the front and on the abdomen as follows: tergite IV with extremely small marginal hairs; tergite V with 2 larger marginal hairs (near the siphunculi); tergite VI with 2 slightly larger hairs, which seemingly belong to tergite VII, because this narrow tergite is encircled by the VIth tergite. Antennae of 4 segments, 111rd segment about $3\frac{1}{2}$ times 11nd, IVth about $2\frac{1}{2}$ times 11nd, with 4 terminal hairs of normal length, i.g., shorter than last segment; primary rhinaria subapically, with markedly elongated conical membrane. Rostrum normal. Siphunculi very distinct, extremely far caudad. Cauda with 2 short hairs. First tarsal joints with 2, 2, 2 hairs.

In embryones, and later at every moult, the long spinal hairs are crossed, to begin with the middle pair between the eyes. The other hairs lie parallel to the long axis of the body but those on VIIth tergite lie head to tail.

Second instar larvae. Very similar to the preceding, but larger and broader. Meso- and metanotum with 3 pairs of marginal hairs, 1st abd. tergite with 2 pairs of marginal hairs. Marginal hairs of Vth abd. tergite much larger. Antennae of 3 segments. First tarsal joints with 3, 3, 2 hairs.

Third (apterous) larval instar. Very much like the preceding, but caudad the large marginal hairs on 111rd abd. tergite often 2 pairs of minute marginal hairs present. VIIth abd. tergite with 2 large submedian hairs and 2 smaller lateral hairs.

Third (alate) larval instar. Like the preceding, but sometimes also 11nd abd. tergite with 1 or 2 long spinal hairs. Near, and sometimes partly cephalad each siphunculus, 1—3 rather small marginal hairs. Antennae thick, pointed, of 5 or possibly sometimes 4 segments; rhinaria very small; hairs present only on the basal segments.

Fourth (alate) larval instar. With wing pads, but otherwise much like the preceding. On the thorax dorsally some additional smaller hairs present. 11nd abd. tergite often with 2 large spinal hairs. VIIth abd. tergite very conspicuously nar-

rowed; its 2 large hairs stand on the posterior angles of the tergite and the more lateral, smaller hairs belong to the VIth abd. tergite.

Host plant: *Litsea chinensis* ("kaju meniran").

Localities: Banjuwangi, 19.IV.1950, 30.V.1950, leg. F. W. RAPPARD; Bogor, 4.VI.1918, 21.VII.1918, 29.IX.1918, leg. P. VAN DER GOOT; Bogor, 13.XII.1931, leg. C. J. H. FRANSSEN.

Notes by Mr. RAPPARD: "On the underside of a leaf a small colony of red-brown, shiny *Thoracaphis*, visited by small red ants. On "kajoe meniran". Scattered on the underside of the leaves and along the lateral veins in rows. Many attacked by fungus. Colour red-brown to blackish purple-brown, duller than the first sample."

The discovery of this aphid on *Litsea chinensis* by Mr. F. W. RAPPARD, who hunted especially for Hormaphidina, and the very kind help of Professor Ir. HARJONO of the University of Djogjakarta who sent an ample supply of fresh specimens of *Schizoneuraphis gallarum* from *Distylium stellare* from the type locality, makes it possible to demonstrate another host-alternation in tropical aphids.

Embryones inside alate fundatrigeniae from *Distylium stellare* are exactly like embryones and first instar larvae of the *Litsea* aphid. The embryones are very characteristic by their siphunculi, the long hairs on dorsum and their arrangement, and particularly by the placing of the spinal hairs on VIIth abd. tergite. The length of individual hairs is quite the same in both embryones and all this leaves no doubt that the *Litsea* aphids are *Schizoneuraphis gallarum* v. d. GOOT, which evidently alternates between *Distylium stellare* and *Litsea chinensis*.

Schizoneuraphis v. d. Goot, 1917, of which *gallarum* v. d. Goot is the typus generis, has generally been placed as a synonym of *Nipponaphis* Pergande, 1906, type *Nipponaphis distychii* Pergande. On the basis of the gall-inhabiting alatae this is correct, but not if the embryones inside them, or their adult exules are studied. Apterous exules of *Nipponaphis* do not show the very large, hollow dorsal setae and their whole prosoma is covered with pustules. Therefore *Schizoneuraphis* v. d. Goot is used here as an independent genus.

Types: VAN DER GOOT left no types. Apterae collected and identified by VAN DER GOOT still exist, but they were collected after the dates given in his 1917 book, and are the true *gallarum*, not the fundatrices which he described. Therefore the authors chose neotypes, alatae from the characteristic gall on *Distylium stellare*, collected at the type locality, Dieng by Professor HARJONO, October, 1957. They are deposited in the collections of both authors.

Nipponaphis ficicola spec. nov.

Apterous viviparous female (Fig. 3, 4).

Morphological characters. Body in dorsal view very shortly oval to almost circular with the legs and antennae at least partly visible (Fig. 3), in lateral view as shown in Fig. 4. Tergum not very hard, pale brownish yellow to dark brown, densely covered with pustules which are slightly more transparent. Tergum divided into two parts by a curved fold or suture which is not membranous; the anterior part has more or less elevated transversely elongated portions on the

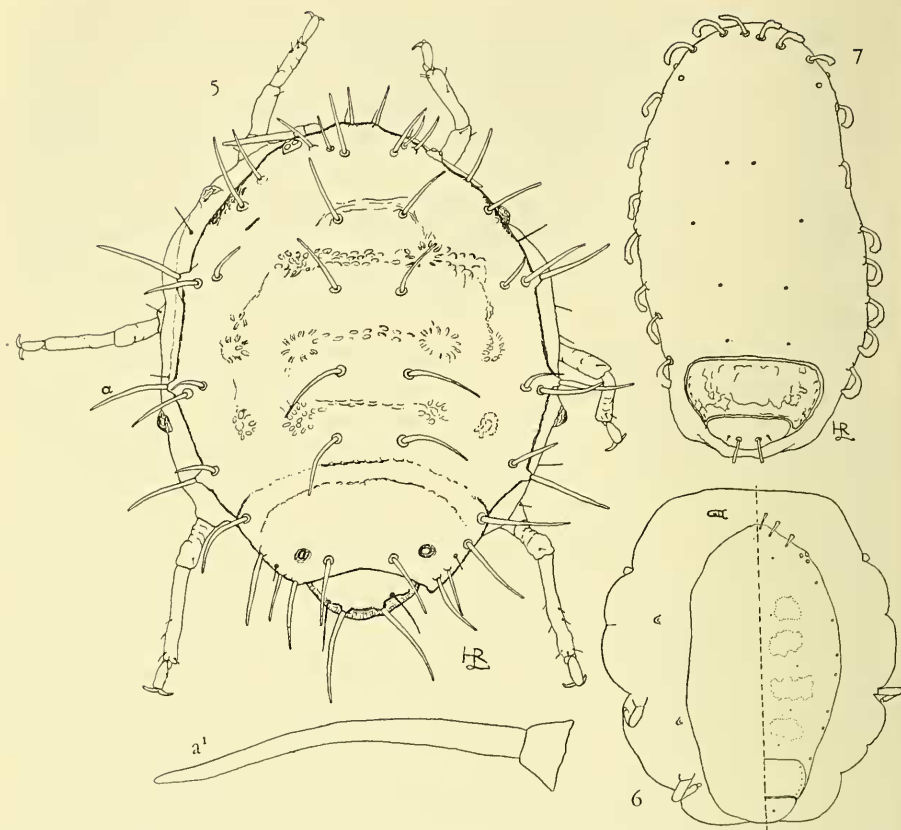


Fig. 5. *Schizoneuraphis gallarum* v. d. Goot. Apterous viviparous female from *Litsea chinensis*, $\times 85$. a^1 left marginal hair from mesothorax, $\times 409$. Fig. 6. *Reticulaphis distylii* subsp. *asymmetrica* nov. Apterous viviparous female from *Ficus*. Left half in ventral view; right half in dorsal view, with three of the marginal hairs drawn in on the head. Fig. 7. *Reticulaphis distylii* subsp. *minutissima* nov. Apterous viviparous female from *Ficus*, $\times 130$

pronotum, mesonotum, metanotum and 1st abd. tergite; the posterior part is only little pustulated and consists of abd. tergites II—VII; this small part is trapezoid in shape and bears two siphunculi on low cones. Hairs long and fine, the dorsal ones about 0.060—0.070 mm long, the marginal ones about 0.080—0.145 mm long, the longest hairs more caudad. Chaetotaxy as follows: head with 4 spinal pairs of hairs and between the posterior pair and the eyes with 2—3 hairs on each side, below the eyes with two more pairs; pronotum with 4—8 irregularly placed spinal hairs and with 2—3 pairs of marginal hairs; mesonotum with 4—6 spinal hairs, more or less in a transverse row, 2—4 pleural hairs and 6—8 marginal hairs; metanotum with 4—6 spinal hairs, 0—2 pleural hairs and 6—8 (normally 6) marginal hairs; abd. tergite I with 2—4 spinal hairs, no pleural hairs and 4—5 marginal hairs. Complex abd. tergite (II—VII) with 6 pairs of long marginal hairs and 2—4 small spinal hairs; VIIIth abd. tergite semicircular with 6 marginal hairs. Antennae of 3 distinct segments, with the 3rd segment slender,

about 0.160 mm long, about $8\frac{1}{2}$ times as long as its largest diameter, with one rhinarium at about two-thirds of its length and another one at the apex; Ist joint often with one hair, IInd joint often with 2 hairs, but IIIrd joint only with 2—3 terminal hairs. Eyes consisting of 3 ommatidia quite near each other on a small tubercle. Rostrum very short, withdrawn as in the other species; last segment normal, with 2—4 long fine hairs. Legs short but of normal structure; tarsi 2-jointed; first joint with 3, 3, 2 hairs; claws often damaged. Cauda broad and short, constricted. Subanal plate deeply bilobed.

Larvae.

Only larvae of probably the penultimate instar available, with a shape rather like adults. Tergum membranous with faintly sclerotic head, pronotum, paired sclerites on meso- and metanotum and Ist abd. tergite, on which the spinal hairs are placed, besides with marginal sclerites; IInd and VIIth abd. tergite with free marginal sclerites, each with one hair, but marginal sclerites of tergites III—VI fused to a large marginal sclerite bearing 4 hairs and 2 siphunculi.

Host plant: *Ficus benjamina*, *Ficus* sp.

Localities: Kali Bendo, Banjuwangi, 400 m, 19.IX.1948, 29.XI.1948, leg. F. W. RAPPARD; Tjibodas, 1.VI. to 30.VII.1956, leg. P. BUCHNER.

Notes by Mr. RAPPARD: "On the bark of branches and twigs of 1 cm diameter. Many black ants visiting. Dark purple to blackish, wrinkled insects."

This species is closely related to *Nipponaphis machilicola* Shinji from Japan, but it differs in the smaller body, the smaller papillae on tergum and in the median pair of setae on VIIIth abd. tergite being much larger.

Types: Cotypes in the collections of both authors.

*Reticulaphis*¹⁾ *distylii* (van der Goot, 1917)

1917. GOOT, P. VAN DER, Contrib. Faune Ind. Néerland., vol. I, fasc. III, p. 247—250, *Schizoneuraphis distylii*.

1927. TAKAHASHI, R., Aph. Formosa 2, p. 55, *Asteopteryx fici*.

The life cycle of this species has not been described. It is known to produce galls on *Distylium stellare* as primary host. It appears to migrate to various *Ficus* species from which it was recorded under other names.

I. Material from *Distylium stellare*.

Fundatrix.

Body about 0.90—1.00 mm long, shortly oval, much inflated, with unpigmented membranous integumentum, and smoky yellowish antennae and legs. Hairs very fine, the marginal ones up to 0.065 mm long. Antennae $\frac{1}{4}$ — $\frac{1}{7}$ of the length of the body, of 3 segments. IIIrd segment almost from base tapering, about $2\frac{1}{2}$ times as long as the sum of the basal segments, at $\frac{2}{5}$ and at $\frac{1}{6}$ from the tip with small rhinaria with digitiform membrane. Last rostral segment about 0.07 mm long. Siphunculi absent. Cauda short and rounded, subanal plate slightly

¹⁾ The genus *Reticulaphis* is described by the second author in *Insecta Matsumurana*, 1958.

incised on posterior margin. Legs short, the fore femora and tibiae each about $\frac{5}{6}$ of the length of the antennae, the hind legs slightly longer, with not incrassate femora.

Apterous viviparous female (IIInd generation in galls).

Much like the preceding morph, slightly more elongated oval. Antennae over $\frac{1}{5}$ length of body, of 5 (or rarely 4) segments, with the segments interrelated in length like 30 : 20 : 45 : 45 : 56; last segment elongated oval, distad its rhinarium somewhat thinner, but hardly tapering, with rounded apex. Siphunculi distinct, slightly pigmented, conical rings close to each other and seemingly on posterior margin of VIth abd. tergite. Subanal plate distinctly incised on posterior margin. Legs slightly longer than in fundatrix, with 2-jointed tarsi, the 1st joints with 3 hairs of which the lateral ones are extremely fine and about as long as 2nd joint, the middle one being thicker and about as long as the 1st joint.

As first instar larva antennae of 4 segments. Tarsi 2-jointed. Siphunculi seemingly absent, but actually present as pori smaller than the papilla of the marginal hairs on VIIth abd. tergite and quite near them. Last rostral segment dorsally with triangular base, about 0.082 mm, i.e., longer than in the adult.

Alate viviparous female (fundatrigeniae, IIIrd generation).

Head and thorax sclerotic; abdomen with only the stigmal plates (4 pairs, on segments II—V) blackish; a narrow band across VIIIth tergite, the subanal plate and the subgenital plate dusky to dark. Head above the median ocellus with 3 pairs of hairs and near its posterior margin with a transverse row of 8—11 hairs of which some are shorter. Marginal hairs on abdomen normal, fine, one pair per segment, about 0.052—0.063 mm long; spinal and pleural hairs rather numerous on 1st abd. segment, about 8—12 in a row, but caudad more scarce so that on segment IV, etc., only 2 spinal hairs are left; VIIIth tergite with about 10—12 normal hairs. Antennae vide measurements; IIInd segment much wider than long; IIIrd segment with 16—28 rhinaria, IVth with 6—13, Vth with 4—9. Siphunculi hardly pigmented, very inconspicuous, placed as in the preceding morph. Cauda rounded. Subanal plate almost bilobed. Legs black with very knobby, basally very thin femora, like the thin tibiae with rather conspicuous, slightly serrate imbrications; chaetotaxy of first tarsal joints as in the preceding morph; those joints in lateral view almost square and on the ventral distal edge with a very small thorn especially on the hind feet; a triangular flat sclerite attached to the 1st joint and touching the ventral side of the 2nd joint precludes articulation between these joints. The two most basal veins in the fore wings (analis and cubitus of some authors) reach the subcosta independently, quite near each other.

Measurements in mm.

No.	Length body	Ant.	Antennal segments			Rhin. on segment		
			III	IV	V	III	IV	V
1	1.61	0.56	0.26	0.13	0.12	25 & 26	12 & 11	8 & 8
2	1.64	0.55	0.25	0.12	0.10	23 & 25	9 & 11	6 & 7
3	1.50	0.56	0.25	0.13	0.12	23 & 25	9 & 9	8 & 8
4	1.62	0.53	0.23	0.12	0.09	20 & 21	9 & 8	6 & 5
5	1.60	0.51	0.23	0.11	0.10	18 & 19	7 & 7	6 & 7

As first instar larvae like those of the preceding morph, but with the head and all the extremities quite dark and with the siphunculi pigmented and about $2\frac{1}{2}$ times as wide as the papilla of the nearest hair.

Embryones inside the preceding morph.

Very different from first instar larvae or embryones described above. Body covered with something like a non-segmented shield, along the margin of which are placed 16 pairs of very thick stiff hairs with widening, flattened, blunt apices; the longest of these hairs, on the head, about 0.030 mm long, which length varies little as far what must be the 1st abd. segment, where on the IInd abd. segment the length becomes suddenly about 0.016 mm to increase again on VIIth and VIIIth tergite to 0.022 mm. Spinal hairs much thinner and shorter, with normal or just bluntish apices; the posterior pair on the head blunt, 0.016 mm long; the pronotal pair, far removed from the former, acute, 0.008 mm long, with the nearby meso and metanotal pairs and that on the 1st abd. tergite of the same length; the other abd. tergites without dorsal hairs. Antennae of 4 segments. Siphunculi absent. Tarsi of 2 joints. Eyes with 3 ommatidia of which one is much smaller and often invisible.

II. Material from *Ficus* spp.

In this several forms may be recognized mainly by the shape of their marginal hairs which is constant in each sample. We give to these forms subspecific names because of their differences, but it is possible that finally these differences will prove to be those between clones. This problem can only be solved by breeding or by much more extensive collecting.

The subspecies key as follows:

- 1 (2) Marginal hairs normal, acute about 0.075 mm long.
Formosa, Java *R. distylii* subsp. *fici* Tak.
- 2 (1) Marginal hairs shorter and flattened, acuminate or with widened, serrated apices, often markedly curved backwards (complex described as *Thoracaphis fici* Tak. var. *foveolatae* Tak., 1935, varietal name without nomenclatural standing).
- 3 (4) Lateral sides of prosoma (pleura of each of its components) extraordinarily expanded (Fig. 6). Also the middle legs visible from above.
Java *R. distylii* subsp. *asymmetrica* nov.
- 4 (3) Lateral sides of prosoma sometimes somewhat expanded, but outline of body still fairly regular. Only knees of hind legs visible from above.
- 5 (6) Marginal hairs with acuminate, not widened tips.
Formosa, Java *R. distylii* subsp. *similis* nov.
- 6 (5) Marginal hairs with much enlarged, obtuse, serrated tips.
- 7 (8) Marginal hairs on posterior half of prosoma somewhat curved.
Java *R. distylii* subsp. *rotifera* nov.
- 8 (7) Marginal hairs all strongly recurved, like flat half-rings, so that the apices are recurved towards the body (Fig. 7).
Java *R. distylii* subsp. *minutissima* nov.

a. *Reticulaphis distylii* subspec. *fici* Tak., 1927.

One sample available from Java, Gedungan, Residency Kediri, 250 m, a small colony on the underside of an old leaf of *Ficus benjamina*, collected by F. W. RAPPARD. According to notes by Mr. RAPPARD, bluish black animals, with a fine white marginal waxy fringe. Indistinguishable from Formosan specimens.

b. *Reticulaphis distylii* subspec. *similis* nov.

One sample from Java, Gerengredjo, Residency Djember, 50 m, 28.I.1950, collected by F. W. RAPPARD. Colony on underside of mature leaf. Dispersed over the whole surface. Blackish blue with slight waxy fringe according to Mr. RAPPARD. More elongated than the main species, but apart from the shape of the hairs and slightly coarser reticulation of the prosoma, very similar.

c. *Reticulaphis distylii* subspec. *asymmetrica* nov. (Fig. 6).

One sample from Java, Salatiga, Residency Semarang, 600 m; 20.XII.1916, collected by the late Dr. P. VAN DER GOOT on *Ficus* sp. with in the sample three specimens of *rotifera* subspec. nov. The subspecies is characterized as follows:

Side of the head bearing the antennae, the pleural regions of the thoracic and 1st abd. segments very strongly expanded and produced like large sclerotic bladders, in which parts of the sternal areas are involved. Antennae extremely short with not recognisable segmentation. Middle legs distinctly visible from above from the coxae onwards. Prosoma + abdomen nearly twice as long as wide. Marginal hairs on prosoma flat with much widened apex, those on 1st abd. tergite only just surpassing the edge of the prosoma, about 0.025 mm long, recurved, the spinal hairs on that segment at most 0.004 mm long.

d. *Reticulaphis distylii* subspec. *rotifera* nov.

One sample from Java, Mandiku, Residency Djember, 70 m, 12.V.1950, collected by Mr. F. W. RAPPARD from the undersides of the leaves of *Ficus ? pruniformis* Bl. (plant identified by Dr. BEUMÉE). In view of the fact that this was a large sample, with all larval instars and alatae, the various morphs and larvae are described in detail.

Apterous viviparous female.

Old adults about 0.50—0.85 mm long, jet black, entirely opaque, so that nothing is visible but the broadly oval body with faintly crenulated margin, the distal part of the antennae, the knees of the hind legs and thick, pale marginal hairs which are flattened on distal half, much widened at apex and there dentated or serrated; the 6 hairs on the front curved outwards; no change in structure after 6 hours boiling in 10% KOH, but after a fortnight's exposure to sunlight in 20% KOH a marginal and ventral black layer peels off and more details become visible. In freshly moulted specimens the body is oblong with more or less parallel flanks, flat and very strongly reticulated dorsally; the part consisting of head to 1st abd. segment very large; the complex abdominal part very small, almost triangular, separated from the rest by a membranous suture, often loosened during the clearing process. Spinal hairs thick, with oblique apices, short and inconspicuous, only 0.012—0.019 mm long; chaetotaxy (of a specimen of 0.76

mm): between the eyes two hairs (mutual distance 0.105 mm); on pronotum 2 hairs (m.d. 0.050 mm), mesonotum 2 hairs (m.d. 0.163 mm), metanotum 2 hairs (m.d. 0.117 mm), abd. tergite I, 2 hairs (m.d. 0.067 mm); distance hairs on head-hairs on pronotum 0.167 mm; pronotal-mesonotal 0.143 mm; mesonotal-metanotal 0.128 mm; metanotal-Ist abd. hairs 0.068 mm. Pleural hairs absent. Marginal hairs about 0.043—0.062 mm long, all somewhat curved upwards and caudad, with fan-shaped apex; arrangement: 6 on head cephalad the eyes, 2 pairs on pronotum, mesonotum and metanotum each, and 1 pair on Ist abd. tergite. The sclerite consisting of abd. tergites II—VII about 0.209 mm wide and 0.081 mm long, reticulated like the rest, without siphunculi and along the caudally converging sides with 6 pairs of very small hairs of which only the bases are visible, as perforations in the sclerite; VIIIth abd. tergite about 0.109 mm wide and 0.048 mm long, with 2 hairs of the marginal type, but thinner and more acute than the others. Eyes consisting of 3 ommatidia standing very far apart, of which one is smaller and more lateral. Antennae without segmentation, consisting of little outward bent hooks (longest arm 0.06 mm) with near apex 2 minute rhinaria and one terminal hair which is directed towards the eyes. Mouth parts evidently completely withdrawn into the cavity of the head and only the apical segment of the labium penetrating outwards through a jagged hole in the ventral carapax; rostrum very short, with rather narrow and hairless apical segment. Cauda knobbed. Subanal plate bilobed. Legs extremely short, in very young specimens with one tarsal joint which has one ventro-basal hair on the front and middle legs, 1 dorso-apical hair on the front legs and 2 dorso-apical hairs on the middle and hind legs; in old apterae the tarsi have no claws and seem to be still more reduced; the legs are always lying bent and flat under the ventral carapax and from above only the knees of the hind legs are visible.

Alate viviparous female.

Like fundatrigeniae from galls, about 1.70 mm long. Marginal hairs of abd. segments IV—VII on dark sclerites. Head and thorax sclerotic. Head on the front above the ocellus with a pair of hairs, more dorsally with a much larger pair, between the dorsal ocelli with another pair and on posterior part of vertex with a row of 4—6 hairs of which 1 or 2 are considerably shorter. Abdomen with segments V and VI probably merged, and there with 2 pairs of large marginal hairs and 1—3 spinal hairs, on segments I—IV and VII with one pair of large marginal hairs, on Ist segment with 4—6 hairs in a transverse row submedially and here and there on tergites II—IV a spinal hair; VIIIth abd. tergite with 2 large median hairs and on each side 2—3 smaller hairs; all the larger hairs about 0.105 mm long, frequently with an abrupt oval swelling rather near the acute apex; the smaller hairs apparently normal, about 0.07 mm long. IIIrd ant. segment with 19—23 rhinaria; IVth with 4—8 rhinaria, Vth with 4—5 rhinaria. Rostrum very short; the rather narrow and conical apical segment with 3 pairs of subapical hairs. A very faint annular structure of about 0.030 mm diameter cephalad the two marginal hairs on abd. segments V—VI suggests the presence of siphunculi. Cauda knobbed. Subanal plate divided into two lobes.

Measurements of one specimen: Length of body: 1.64 mm; ant.: 0.62 mm; Prop. of ant. segments: $\frac{100}{III} : \frac{38}{IV} : \frac{23}{V}$. Rhin. on IIIrd ant. segment: 19 and 23; on IVth: 8 and 6; on Vth: 4 and 5.

Larvae with the preceding adults.

First larval instar. Elongated oval, caudad pointed, with head + prothorax wider than the rest of body. All tergites except VIIIth abd. tergite cleft along the median line. Head fused with pronotum; meso- and metanotum free, but Ist abd. tergite fused with all the other abd. tergites; all these parts sclerotic and dark. Arrangement of spinal and marginal hairs as described for adult apterae, but all the abd. tergites with a pair of stout marginal hairs, of which those on Ist and VIIIth tergite are longer than the others; the marginal hairs on head and pronotum longer than all others and often not much enlarged at apex, merely blunt; spinal hairs all very short. Antennae normally shaped and of 4 freely movable segments; last segment about as long as IIIrd, with 4 terminal spines of which two are longer than the segment. Mouth parts normal, but the clypeus somewhat retracted into the head. Legs normal.

Second larval instar. Much like the preceding, but the 6 pairs of hairs of abd. segment II—VII thin and very short, much less than half as long as those on abd. segment I; VIIIth abd. tergite with two small lateral hairs besides the large median ones. Antennae elbowed, without distinct segmentation, though sometimes 3 segments are discernible; only one terminal bristle left. Last rostral segment hairless. Legs normal.

Third (apterous) larval instar. Much like the preceding and tergum still quite smooth, not reticulated. Complex of abdominal segments already much reduced in length, but not yet markedly cut into and anterior part and VIIIth abd. tergite. Legs with one tarsal joint and with claws, though the tarsi of the hind legs often already clawless and reduced. Marginal hairs often with nearly normal apices, but blunt.

Third (alate) larval instar. Very different from adults and preceding larval forms. Head and part of pronotum black sclerotic, remainder membranous with rather circular tubercular sclerites which bear hairs and usually also curious organs of various sizes which in dorsal view look like a semiglobe surrounded by a dial in a ring, in lateral view like a very short cylinder into which a smaller semiglobe is pushed; those organs are termed button-organs here. Hairs moderately long, about 0.05—0.07 mm, rarely once branched or with abnormal apices. Button-organs from 0.024—0.008 mm in diameter, the small ones only occurring near a larger one. Head with 2 button-organs, each between 2 hairs. Pronotum spinally on anterior half with 2 button-organs, on posterior half with 2 button-organs near 2 hairs, marginally with 2 tubercles bearing each 1—3 button-organs and 2 hairs. Mesonotum with 2 spinal button-organs with each 1 hair and marginally with 2 tubercles each bearing 2 button-organs and 2 hairs. Metanotum like mesonotum. Ist abd. tergite only with marginal tubercles each bearing 2 button-organs and 1 hair; IIrd and IIIrd abd. tergite with spinal sclerites without hairs, but each with 1 button-organ, and with marginal sclerites each with 2 button-organs and 1 hair; IVth tergite like Ist; Vth tergite probably fused with VIth tergite, only with large marginal sclerites each bearing on anterior margin a slightly elevated siphuncular porus with a diameter of about 0.02 mm and on posterior margin 2 hairs and 2 button-organs; VIIth tergite only with marginal sclerites with 1 hair and 1 button-organ; VIIIth tergite only with 2 hairs. All the so far mentioned hairs are very long and placed on sclerotic plates, but also other hairs of smaller size occur

in a rather irregular way. Antennae very thick, curved, with 3 membraneous transverse lines indicating 4 segments; primary rhinaria distinct; 3—4 short terminal bristles present. Eyes still of 3 ommatidia. Legs short, thick, normal, the claws on hind tarsi and to some extent the other tarsi very distinctly ventrally inserted.

Fourth (alate) larval instar. Much like the preceding, but with wing pads. Long dorsal and marginal hairs to 0.1 mm long, fine and sinuated, very often near apex suddenly attenuated into a much finer hair, or with a minute swelling below a thin apical part. Differences in chaetotaxy and number of button-organs with the preceding larva are: head between the eyes spinally with 2 more hairs; marginal tubercles on pronotum large, with 3—4 button-organs, on mesonotum 3, on metanotum 1—3; 1st abd. tergite with 2 spinal hairs on scleroites; siphuncular pores about 0.024 mm wide; more additional hairs, not on scleroites, present, but irregularly. Antennae indistinctly of 5 segments; the rhinarium on IVth segment extremely reduced to absent; 2 terminal bristles present. Eyes with 3 large facets (triommatidion) and a nonbordered field of small facets (compound eyes).

Embryones inside alate from *Ficus*.

All rostrate, probably of two very different sizes inside of alate, and at least the smaller ones with round wax-glands near the marginal hairs with usually only the glands on tergite \pm VI or VII very distinct in the pale material. Hairs normal, not thickened and apparently acute. Siphunculi not discernible. In the larger embryones the femora and tibiae appear to be thickened, but pressure on the cover slip might be responsible for this. Mouth parts and stylets normally developed.

Notes by Mr. RAPPARD: "Three different insects sit in small groups, not separated, dispersed on the undersides of the old and leathery leaves. Visited by aggressive black ants. A) flat insects, old ones with waxy fringe, dark purplish black; young larvae olive-green transparent elliptical discs. B) though they are quite different from A, I suppose that this is a separate generation from which nymphs and alatae develop; irregular outline with swollen thorax; older specimens with upstanding woolly waxy fringe marginally, medially with waxy bushes; besides between these with long, erect threads of which I cannot make out whether this are wax- or chitinous filaments; colour in alcohol dull greenish blue to dirty brownish green. C) alatae with flat wings, swollen thorax, no wax, dark purple to black."

From a sketch by Mr. RAPPARD it appears that the location of the wax corresponds with the position of the button-organs, viz, 5 dots spinally and about 8 laterally on each side; siphunculi black, nude spots. The button-organs secrete the long, hollow glassy wax-rods that stand up in the woolly bushes of wax as mentioned in Mr. RAPPARD's notes. This is evident from manuscript notes found among Dr. VAN DER GOOT's possessions.

e. *Reticulaphis distylii* subsp. *minutissima* nov. (Fig. 7).

One sample from Java, Punten, 1350 m, Residency Malang, end of March

1950, collected by Mr. F. W. RAPPARD from the undersides of old leaves of *Ficus benjamina*. Notes by the collector: "Very small blue-black to black, some living specimens with white waxy fringe. Larvae greenish yellow. In groups or solitary, not on young leaves. No ants."

The subspecies is conspicuous by its elongate body, small size (0.36—0.53 mm), but above all by the curious marginal hairs with their rough surface.

The specimens from *Distylium* were taken from galls as described for *distylii* by VAN DER GOOT¹). Galls containing fundatrices and some adult apterae of the second generation were collected on 29.VIII.1957, others with many alatae in October 1957, all near Dieng on the Dieng Plateau, by Professor HARJONO of the University of Djogjakarta, to whom we are very much obliged for his admirable help. Embryones from alatae collected from these galls are indistinguishable from first instar larvae found in the sample described here as subspec. *rotifera* nov. There can be little doubt but that the aphids from *Distylium stellare* migrate to *Ficus*.

Types. An original slide made by VAN DER GOOT, containing alatae and nymphs of *Schizoneuraphis distylii*, collected near Kadadjar (Dieng Mountains), 20.VIII.1915, was recently refound and remounted. These are made lectotypes and of the present two slides one is in the collection of the Entomological Laboratory of the Agricultural University, Wageningen, Netherlands, the other in the collection of the first author. Cotypes of the subspecies *fici* Tak. in the collection of the Taiwan Agricultural Institute, Taipei, Formosa, those of subspec. *asymmetrica* in the collection of the first author, those of the other subspecies in the collection of both authors.

¹) Recent material and data received from Prof. HARJONO show that there are two similar galls on *Distylium stellare* with quite different inhabitants. The galls described by VAN DER GOOT do not contain *distylii* van der Goot; *distylii* produces a gall which is not semiglobular above the leaf surface, but rather elevated fingertip-like. VAN DER GOOT described the gall as brownish green, but that is the colour of the ripe fingertip-like galls. The semiglobular galls described by VAN DER GOOT turn red when ripe.